Chapter 6 Create-View-Draw Cross Sections

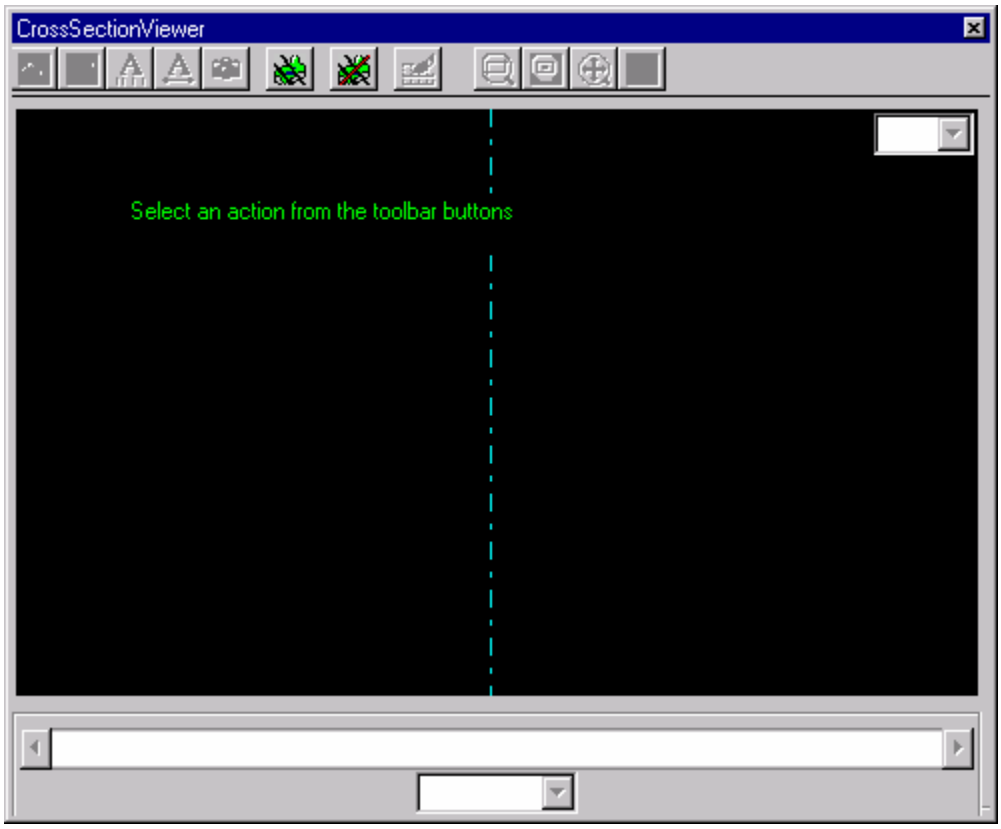
We can either use input files to create cross sections, or use MXRoad's Cross Section Viewer to do this. There are some distinct advantages to using the MXRoad sectioning functions, however, the best of which is the addition of skewed sections (for drives, pipes, etc) into the cross section drawings. In this chapter, you will see how to:

- Create-View Cross Sections with the MX Cross section Viewer
- Create Cross Sections with an INPUT File
- Draw Cross Sections with MDOT Draw Cross Sections.exe Add-In

Create-View Cross Sections with the MX Cross Section Viewer

The viewer for creating and viewing cross sections was introduced with MX Version 2.5. This tool took the previous MX Cross Section Wizard functionality, and combined it with a dynamic cross section viewer with very similar features to the Profile Viewer. To use the Cross Section Viewer:

Step 1 - Select ***Analysis => Sections => Cross Sections*** from the menu bar. The Cross Section Viewer will appear:

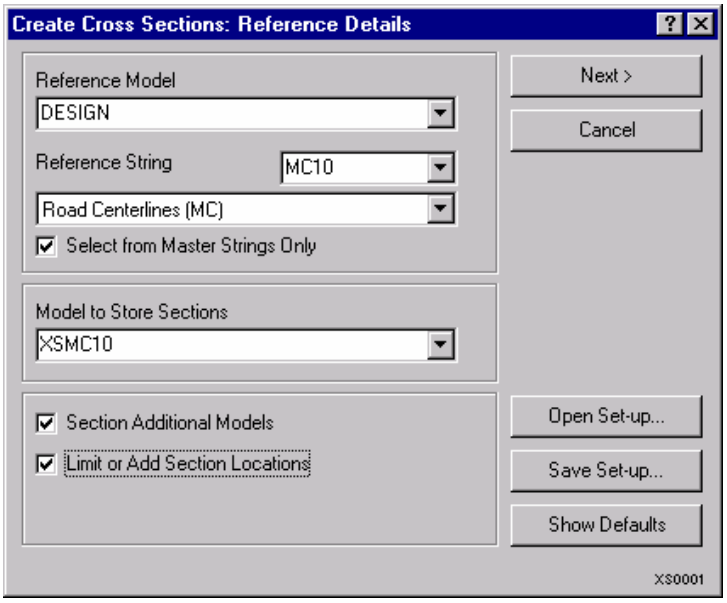


The cross section viewer can be used to create and display cross sections during the design process. It has three distinct areas; a toolbar containing icons for all the options available with the viewer, a graphics area in which the sections are displayed, and a station selector.

NOTE: The Cross Section Viewer, like the Profile Viewer, is a dockable window, which will allow you to view both plan and cross section information simultaneously in the MX Graphics Display. For more information on how to dock and undock the cross section viewer, please refer to MX User Note DCK-1 - Docking the Profile and Cross Section Viewers.

When the cross section viewer first appears, only two options are available; *View Existing Sections*  or *Create New Cross Sections*  .

Step 2 - Click the ***Create New Cross Sections*** icon. The Reference Details panel will appear:



In the example shown here, we will cut cross sections relative to M-String MC10, and place these sections into a model called XSMC10.

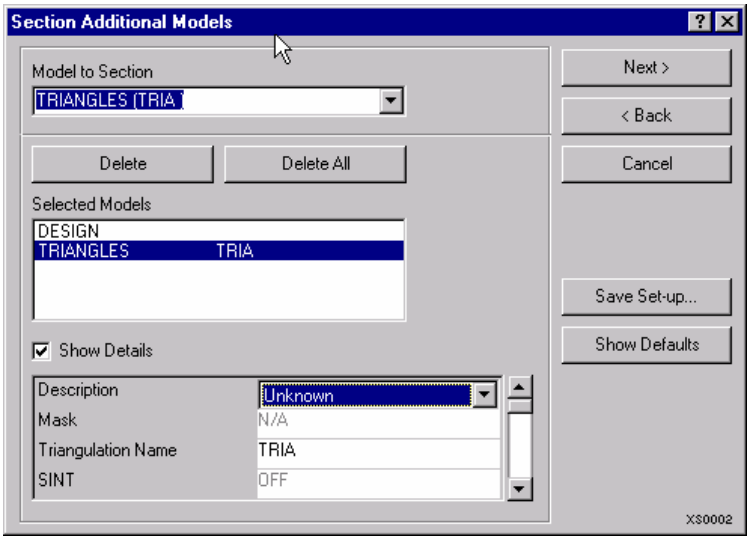
Make sure the ***Section Additional Models*** and ***Limit or Add Section Locations*** boxes are checked off.

This will allow us to create sections of our existing ground, proposed template, and later in the design process our subgrade model.

NOTE: If you have already used this wizard to cut sections and wish to cut them again due to design changes, you can select Open Set-Up to retrieve previously-saved wizard settings.

Click ***Next*** to proceed.

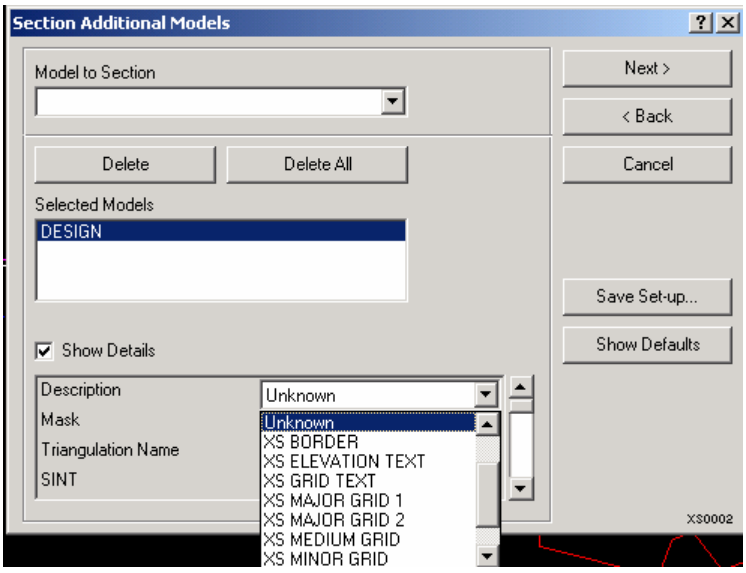
Step 3 - The section Additional Models panel will appear.



Create a ***List of Selected Models*** by choosing them from the dropdown box labeled ***Model to Section***. Most commonly you'll want to use DESIGN and TRIANGLES, and later add SUBGRADE.

Make sure the ***Show Details*** box is checked. Below this box is an area where you can provide a description of these sections.

Assign Descriptions (feature types) to each model. Highlight the DESIGN model in the Selected Models list, and observe the ***Description*** field in the Details box.

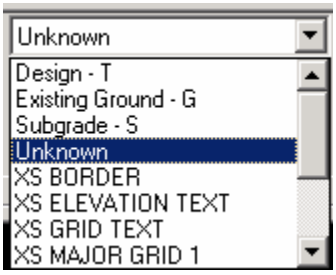


It will default to "Unknown". Click on the word unknown, and you'll see a list of section types, which are derived from the MDOT Cross Section Feature Set. Select the appropriate feature that describes the sections from the highlighted model.

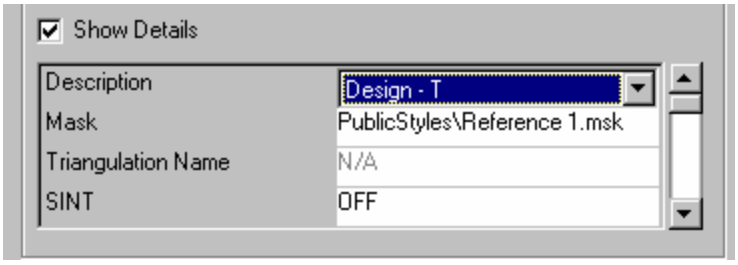
The Feature type determines the Section Set Identifier which is the first character of the section string labels for this model. (i.e. G001, T001, S001, etc.)

Model Name	**Feature Type**	**Section Set Identifier**
TRIANGLES	Existing Ground	G
DESIGN	Design	T
SUBGRADE	Subgrade	S

These choices can be located by using the scroll bar in the drop down box—they are located above "Unknown".



Repeat this step for each of the Models listed in the Selected Models list.



Note that when you select the DESIGN model, and choose the Design feature type, a file path will appear in the Mask field under the Description field.

In our example, it's **PublicStyles\Reference1.msk**. This file is a *Mask File*, and is used to prevent certain design strings from being included in the cross section. The file Reference1.msk will exclude all Reference strings (Mc1?) that have the number 1 as the 3rd character of the string label. ***Make sure this Mask Field is blank if you wish to section all of the strings in the Design model.***

Mask files are simply small text files with some MX command language lines in them. The contents of Reference 1.msk look like this:

```
019,M 1  ,4=-1
019,  1  ,4=1
019, ,4=-1
```

Minor Option 019 is a Global Minor Option used to define string label masks. There are two fields to be concerned with. Field 1 is the string label, or portion of a string label to either mask out or include. Field 4 contains a "1" to include that string mask, or a "-1" to exclude that string mask.

In the example above,

The first line: (019,M 1 ,4=-1) indicates that all strings in the specified model with the 1st character "M", and the 3rd character "1" should be masked out. In this case, that would mean they will not be included in the cross sections.

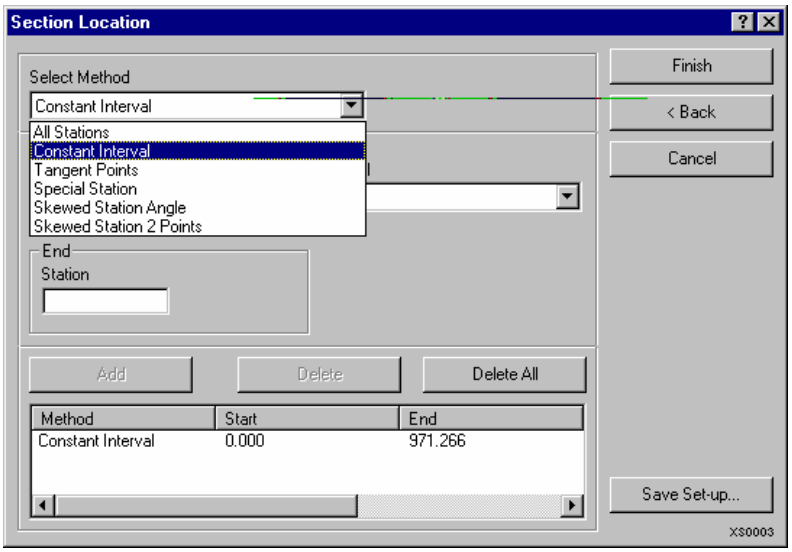
The second line: (019, 1 ,4=1) indicates that all strings with the 3rd character of "1", other than those masked out in previous lines, should be included when cutting sections.

The last line: (019, ,4=-1) specifies that all other strings in the model not specifically masked out or included in previous lines should be masked out when cutting the cross sections. This means that strings associated with alternate alignments for main line roadways, or strings associated with side roads will not be cut. Only those strings created from alignment MC10 will be included in the sections.

Once you've assigned descriptions, and mask files if necessary, to your models,

Click **Next** to continue.

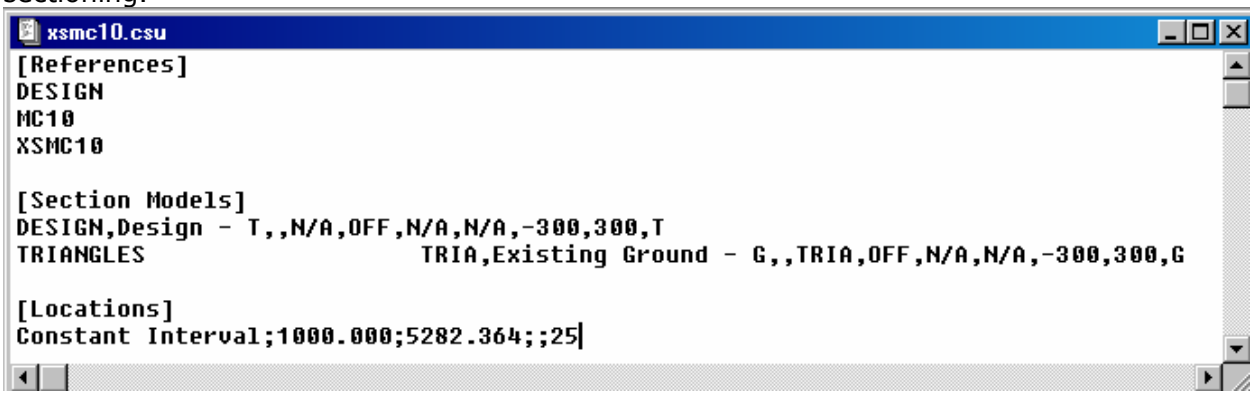
Step 4: We also checked off the box to set limits to sectioning, and/or specify additional sections on the first panel of this wizard. The following panel should now appear:



As you can see from the dropdown box, you can create a list of stations which will be sectioned, and also create skewed sections for pipes or driveways here as well. The data required changes as you use a different Method from the dropdown box. As each section or group of sections is specified, click the Add button to build your list.

Click ***Save Setup*** to save this group of cross section wizard settings for later use or modification. All of these settings will be stored in the Cross Section Setup (*.csu) file that you now have an opportunity to create. Give this file a meaningful name such as XSMC10.csu for alignment MC10. The file is kept in the project MXData directory by default, so it would be a good idea to back this up along with the model file, or other project files. Here's what the file looks like in the PFE text editor:

You can see it under the [Locations] header how it's saving your list of stations for sectioning.



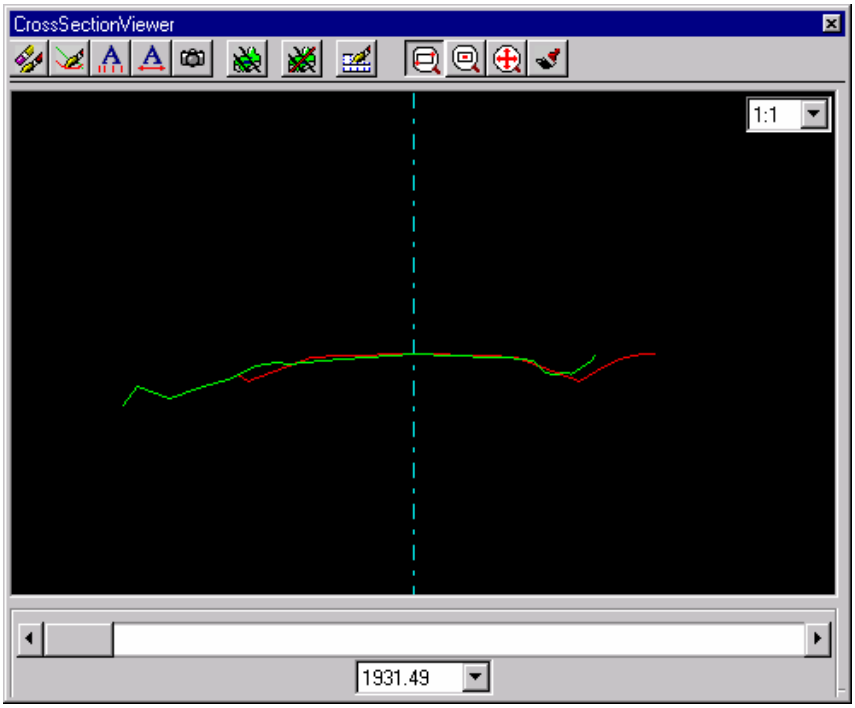
After you've saved your settings to file, simply click on ***Finish*** to cut the sections and display them in the Viewer.

NOTE: *In the current version of MX, the Skewed Station (Angle and 2 points) choices may cause problems when attempting to draw these sections. A bug in the software creates the sections but does not activate the cross section viewer. This error message may appear or the sections will process and the Cross Section Viewer will be minimized onto you task bar.*

When you click on the minimized Cross Section Viewer you will be given a Run-time error '13'. Click OK.

The sections did process, go to *Analysis\Sections\Cross Sections\ and choose to open the existing sections. This will activate the cross section viewer and the cut sections will then be displayed.*

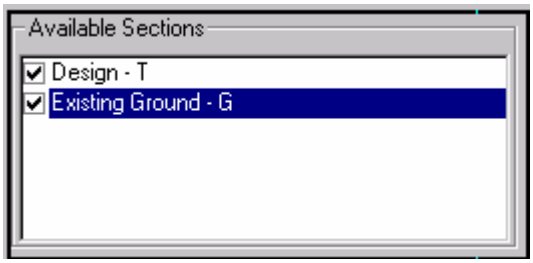
<u>Step 5</u> - **<u>Viewing The Sections</u>**. Once the sections have been cut, they will be loaded into the Cross Section Viewer:



NOTE: The cross section viewer can be used to assess a design very quickly It provides facilities to inspect cross slopes, road widths, grades, etc. and is linked to the plan working display so that you can see the location of the section being viewed just as with the Profile Viewer. With tracking switched on, this link works both ways, i.e. moving the cursor along a string on the plan display updates the cross section being viewed.

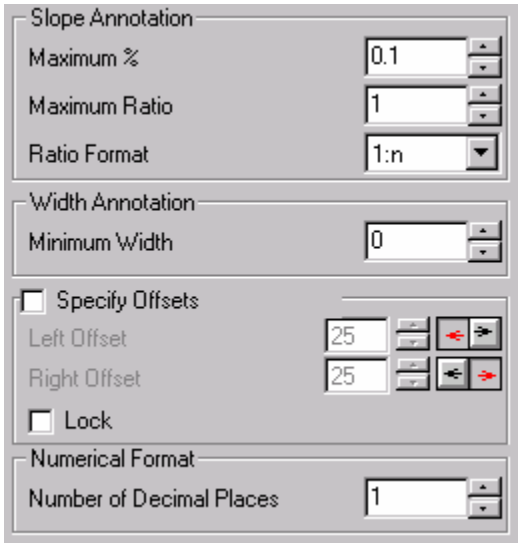
The horizontal scrollbar at the bottom of the viewer, and the drop-down box at the bottom allow you to control which station is currently being viewed.

The other tools available on the toolbar include:

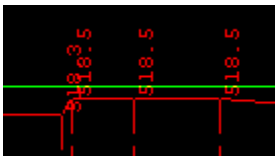


 *Section Display* - This lists the available sections to display, and allows you to turn them on or off in the Viewer.

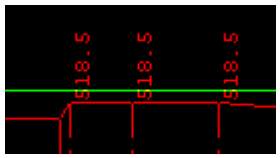
 *Annotation Ranges* - This tool allows you to configure how the annotation appears, i.e how many decimal places, how slope is expressed, etc.



Minimum Width can be specified to exclude certain string points from being annotated if they are close together.



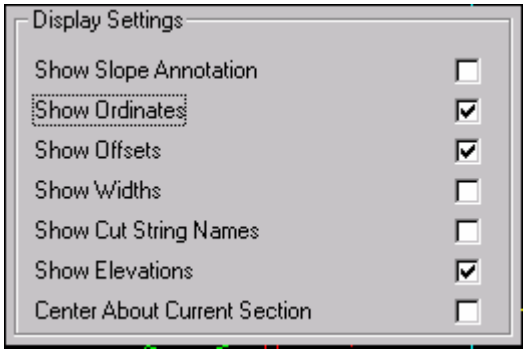
Minimum Width = 0



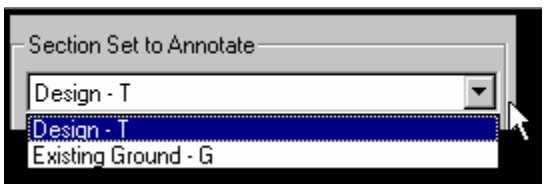
Minimum Width = 0.1

 *Annotation To Display* - The Display settings are shown in an attached panel shown to the right.

Look at the section displayed in the viewer as you check these boxes off to see what effect they have.



 *Current Section Set* - This tool allows you to pick which section set is currently being annotated in the display.



 *Zoom Tools and Refresh View*

Step 6 - Close the Viewer by clicking the cross in the upper-right hand corner.

Create Cross Sections - Input File Method

Not recommended.

It's strongly recommended that you learn to use the MX Cross Section Viewer described in the section above as it fits well into the process for creating cross section drawings for plotting or transfer to MicroStation.

We normally create 3 different sets of cross sections, the existing ground, proposed template, and proposed subgrade or G,T, and S sections respectively. The G,T, and S refer to the "section set identifier" which we assign to each type of section.

The Master Alignment String you created, MC10, has a station interval of 25 feet. MX has created a point in that string at this interval, plus an additional point at each vertical and horizontal geometric point. Sections can only be drawn at those stations where points exist on your M-String, but you don't necessarily need to create sections at every point on your M-String. The two ways to deal with creating/drawing sections in an input file are:

1. Create Sections at each point / Specify which sections to draw
2. Create Sections at specified points / Draw all sections

You must choose which method to use, and it's pretty much a matter of personal preference. Creating sections at each and every point on your M-String will provide a more realistic interface (earthworks) string near the end of the design process, but may not accurately be reflected in your final section drawings. Creating sections at a specified interval will be accurately coordinated with the plan drawing, but won't model the earthworks as accurately.

Major Option SECTION

Major Option SECTION is the means by which we create cross sections in MX. A number of Minor Options are available under SECTION, though the Master INPUT files are set up using only two of them. It is important to understand that the section strings created when you use this Major Option only represent a model's strings at a particular moment in time. ***As you add strings to your model after originally creating the section strings, you must delete and re-cut the sections for the new feature strings to be reflected in the sections.*** This requirement is mainly for your Template and Subgrade sections, though if you decide to change the section interval, or if you add points to your M-String for driveways or quantity sections, you'll need to re-cut all three sets of cross sections.

There are two Minor Options used to create cross-sections in the Master INPUT Files:

Minor Option 174, Cross - Relative To A Master: This option is used to create section strings by cutting all feature strings in a given model within the left and right offset limits specified. These section strings are centered on, and cut along perpendiculars to points contained in a Master Alignment String (M-String). The Template Sections, T-Sections, and Subgrade Sections, S-Sections, are created using this minor option. The INPUT Files "C-XS-T-MC10.INP" and "C-XS-S-MC10.INP" are used to create the section strings for template and subgrade, respectively.

The key lines in the first file are:

```
SECTION,DESIGN,DESIGN
SECTION,XSMC10
174,MC10,,T,25,7=-100,10=100
999
```

The first line sets up Major Option SECTION, and specifies the model to be sectioned, and the model containing the Reference String (M-String).

The second line specifies the model in which the section strings are to be stored.

The next line is the Minor Option 174 command line. The command will cut all strings in the DESIGN model within 100 feet of the M-String MC10. Section Strings will be created at 25 feet intervals and be assigned labels beginning with the letter "T".

The field definitions for this minor option are:

```
  Field 1   Reference string, must be a master alignment.

  Field 2   If secondary interpolation is required, code SINT.

* Field 3   Specify an initial character to give a unique reference to the
stored sections

* Field 4   Chainage interval between sections

  Field 5 & 6     SPRD start

  Field 7   Left most offset - specify sign if negative

  Field 8 & 9     SPRD end

  Field 10  Right most offset - specify sign if negative

The start and end chainage need not be on a regular chainage interval but
every point considered must exist on the master alignment.
```

Minor Option 178, Cross - Through Triangulation: This option is used to create section strings by cutting a triangulation string in a given triangle model within the left and right offset limits specified. The Existing Ground Sections, or G-Sections, are created using this minor option.

The INPUT File "C-XS-G-MC10.INP" is used to create the section strings based on the TRIANGLES model. The key lines in the file are:

```
SECTION,TRIANGLES,DESIGN
SECTION,XSMC10
178,MC10,TRIA,G,25,7=-100,10=100
999
```

The first line sets up Major Option SECTION, and specifies the model to be sectioned, and the model containing the Reference String.

The second line specifies the model to contain the sections.

The third line is the command line for Minor Option 178. It creates a section string that begins with the letter "G" every 25 feet along M-String MC10. These section strings contain are produced by cutting the triangle string TRIA within 100 feet left and right of the M-String.

The field definitions for this minor option are:

```
* Field 1   Reference string
* Field 2   Triangulation label
* Field 3   Section set initial character
  Field 4   Chainage interval, if blank use all points on the reference string
  Field 5 & 6     SPRD of start
  Field 7   Leftmost offset
  Field 8 & 9     SPRD of end
  Field 10  Rightmost offset
```

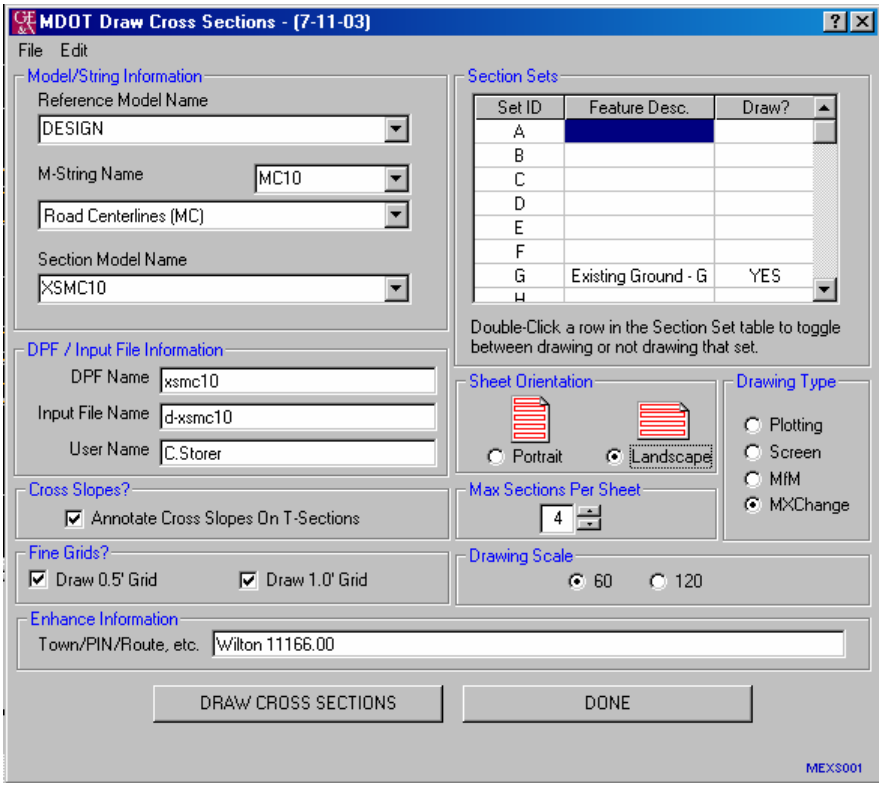
Drawing Cross Sections with MDOT Draw Cross Sections.exe

It is recommended that the cross section sets be processed with the ANALYSIS-CROSS SECTION method.

Running the MDOT Draw Cross Sections Add-In:

Select ***Draw => MDOT Draw Cross Sections*** from the menu bar.

The following panel will appear:



The information required to create the drawing is grouped together in frames on the panel. Each group will be discussed in detail below. Last-Used values are remembered for each combination of Reference Model Name and M-String Name, so that the second time you enter these two fields, the remaining settings for the panel are automatically filled in.

Model/String Information You must specify the Reference Model name and M-String Name that the sections were created from, as well as the Section Model Name where the cross sections are stored.

DPF / Input File Information This program will create a cross section drawing (DPF) with whatever name is given in this area. It is recommended you use a meaningful name here

such as "**XS**" prepended to the Master String name, which would be "**XSMC10**" for master string MC10. Don't include the files extension ".DPF" in here, as it will be added automatically for you.

When filling in the Input file name, use the DPF name and start it with a " **D-** " to signify that this is an input file that will DRAW your xsection pages. "**D-XSMC10**" Once again do not include the file extension, it will be added automatically.

Enhance Information This box is where you can give information about the road, town, or any other information deemed appropriate to help identify the drawing for you. If you check off "***Check To Annotate Cross Slopes On Design Sections***", the slope of each line on the Design Model template will be annotated.

Section Set Identifiers This frame allows you to specify a section set identifier for an existing ground model section, a design model section, and a subgrade model section. You don't have to draw all of these section types though. Simply double click on the section set to toggle a yes into the box for drawing.

Drawing Type Select which type of drawing you want to create.

MxChange this option is used to create drawings that will be transferred to MicroStation using MxChange

.

Plotting this option is used to create drawings in the "Plotting Color Scheme", which are colors that produce a nice-quality plot on our OCE plotters directly from MX.

Screen this option creates a drawing that is optimized for viewing sections on the screen only. If you want to plot these sections, regenerate the drawing using he Plotting Color Scheme.

MfM This is the option that will be used when displaying in Mx for Microstation. Mdot doesn't use this option yet.

Drawing Scale Select from 60, or 120 scale drawings.

Sheet Orientation Select either the Portrait or Landscape option to create "tall" or "wide" cross sections.

Max Sections Per Sheet This is the maximum number of sections per sheet. Changing this value will allow you to put more relatively flat sections, such as those found in urban settings, onto a sheet.

Entries are mandatory in each of the frames on this panel. When the desired information has been entered, click on the ***Draw Cross Sections*** button to generate the drawing. Click the ***Done*** button to exit the program.

Drawing Cross Sections with Input Files

We can draw the cross sections using one of two input files. Please note that both of these files are written so that 3 types of section strings can be displayed. The GROUND Sections, or "G" Sections, the TEMPLATE Sections , or "T" Sections, and the SUBGRADE Sections, or "S" Sections. ***These input files are not configured to create section drawings in either the Plotting Color Scheme, or the MxChange Color Scheme.*** That's one of the

primary reasons you are encouraged to use the MDOT Draw Cross Sections AddIn to create these drawings.

The two Master INPUT Files for drawing cross sections are:

D-XS-27-MC10.INP- This file draws the cross sections in the "portrait" mode. The top of the sheet would be one of the narrow sides of the paper. The longest length of the paper would run from top to bottom.

D-XS-37-MC10.INP- This file draws the cross sections in the "landscape" mode. The top of the sheet would be one of the longer sides of the paper. The narrowest length of the paper would run from top to bottom.

The resulting cross-section DPF consists of multiple sheets. The last sheet in the DPF is displayed when the file has completed running.

A few notes about using MXRoad sections with our drawing INPUT files:

When using the D-XS-27-MC10.INP file or D-XS-37-MC10.INP file to draw your sections, please note the following change to the 804 card must be made:

```
804,CROS,ABS,MC10,10,,7=-50,,10=50
```

Would become:

```
804,CROS,ABS,MC10,,,7=-50,,10=50
```

You should notice I've simply removed the section interval (10) from field 4. This will draw all of the sections that were cut by MXRoad. If you forget to remove this interval, then any special sections or skewed sections will not be drawn.